Forest Insect Laboratory
Berkeley, California
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FOREST INSECT SURVEYS

MODOC NATIONAL FOREST, CALIFORNIA

Season of 1938

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LAVA BED

NATIONAL MONUMENT

R.5E. R.6E. R.7E. R.9E

TIMBER MT.

GLASS MOUNTAIN

BADGER

MC-4

RS-5

MC-7

MC-6

MC-5

MC-1

RS-1

MC-2

BEDS

LAVA

MC-8

PIT RIVER

RS-3

MC-1

HAPPY CAMP

RS-2

RS-6

MC-10

WHITE

HORSE

O MT SHASTA

T. 42 N.

T. 41 N.

T. 40 N.

T. 39 N.

U.S. BUREAU OF ENTOMOLOGY
AND PLANT QUARANTINE

REGIONAL SURVEYS

MODOC NATIONAL FOREST, CALIFORNIA

REGIONAL SURVEY BOUNDARY
INFESTATION UNIT BOUNDARY
SAMPLE PLOT; VIRGIN STAND
SAMPLE PLOT; CUTOVER STAND
CUTOVER LAND AS OF JAN. 1, 1938

J.H. FISKE

FOREST INSECT SURVEY - MODOC NATIONAL FOREST

Season of 1938

INTRODUCTION

The 1938 annual forest insect survey for the Modoc National Forest was conducted by members of the Forest Insect Laboratory during the period of October 26 to November 8, 1938. The survey crew was under the direction of R. C. Hall, assisted by W. D. Hagenstein and C. S. Badman. This survey consisted of a 100 percent cruise on 4,800 acres, comprising 13 virgin and 2 cutover permanent sample plots of 320 acres each. The distribution of these plots is shown on the accompanying map, figure 1.

SURVEY PROCEDURE

The method employed in 1938 was standard survey procedure for the California region, with the exception that all windfall losses were numbered and recorded on the loss map and loss slips.

CHARACTERISTICS OF THE 1938 INFESTATION

The indications are that the 1938 loss due to insects in the Modoc will exceed that for 1937 by about 40 percent. In spite of the grouping tendencies in the 1938 broods, found on practically all plots, the general infestation conditions are still in the low loss stage. There has been a consistant increase in the proportion of volume infested by the western pine beetle and likewise a consistant decrease in proportion of volume infested by the California flatheaded borer. Previously topkilled trees have contributed a high proportion of the total volume loss and have been instrumental in numerous cases in initiating groups.

BASIS FOR 1938 LOSS ESTIMATE

Only partial loss records are available for 1938 due to the fact that many of the 1938 winter brood trees had not started to fade at the time of the fall cruise. It is necessary each year to make an adjustment for this factor in order to arrive at an estimate of the total loss figure for the year. It was assumed that approximately 60 percent of the tatal 1938 volume was cruised during the past fall and the 1938 estimated figures are based upon that assumption.

INSECT CAUSED LOSSES

Table 1 offers a comparison of insect caused losses on the 13 virgin Modoc plots for 1936, 1937 and 1938. These data are presented by

TABLE I. PLOT LOSSES - MODOC NATIONAL FOREST

Plot	1936 Per Section No. Trees	1936 Per Section Volume B.M.	1936 Per A. Volume B. M.	Ratio 36/35	1937 Per Section No. Trees	1937 Per Section Volume B.M.	1937 Per A. Volume B.M.	Ratio 37/36	1938 (estimated) Per Section No. Trees	1938 (estimated) Per Section Volume B.M.	1938 (estimated) Per A. Volume B.M.	Ratio 38/37
RS-1	126	118,380	185	0.5	78	74,620	117	0.6	113	106,820	166	1.4
RS-2	110	68,180	107	0.1	36	48,580	76	0.7	90	94,780	148	2.0
RS-5	84	76,920	120	0.3	96	93,760	146	1.2	126	96,640	151	1.0
RS-6	92	55,860	87	0.5	66	65,920	103	1.2	122	103,040	161	1.6
RS-11	57	58,130	91	0.6	42	53,060	83	0.9	80	106,500	166	2.0
MC-1	72	50,740	79	0.3	76	59,710	93	1.2	180	137,090	214	2.3
MC-2	112	122,240	191	0.4	60	73,920	116	0.6	116	118,020	184	1.6
MC-3	142	141,520	221	0.5	182	196,030	306	1.4	210	203,650	318	1.0
MC-4	60	58,380	91	0.3	108	89,340	140	1.5	276	164,860	258	1.9
MC-5	30	19,560	31	0.3	26	19,840	31	1.0	46	30,660	48	1.6
MC-6	50	28,680	45	0.1	50	50,690	79	1.8	30	40,770	64	0.8
MC-7	64	70,760	111	0.4	80	80,190	125	1.1	60	61,950	97	0.8
MC-8	124	88,300	138	0.5	46	49,980	78	0.6	56	62,590	98	1.3
Aver.	89	73,660	115	0.4	73	73,511	113	1.0	115	102,100	160	1.4

individual plots on both a per section and a per acre basis together with the ratio of current loss to that of the preceding year. Referring to these ratios it may be noted that there was a marked reduction in loss in 1936 over that in 1935, with the 1936 loss being only about 40 percent of that for 1935. The 1937 loss was approximately the same as that of 1936 with these two years representing the lowest point in the past loss cycle. The previous low point in the Modoc was reached in 1930, attaining a peak in 1934 followed by a decline until 1937. It appears now that another upswing may have started as the 1938 loss shows an increase of approximately 40 percent over that of 1937.

LOSSES OTHER THAN INSECTS

The only losses other than insect caused, on the sample plots, proved to be those caused by windfall. This factor contributed 3.6 percent of the total loss volume of 1938.

GROUPING

There was a definite tendency toward grouping in the 1938 kill. (Figure 2). No satisfactory explanation seems possible at this time as to the cause of this grouping, as the loss is still in the low loss stage, comparitively speaking. Of the total number of trees cruised in 1938, approximately 50 percent were in definite groups. These groups, however, were comparatively small with an average of approximately 3 trees and a maximum of 8.

COMPOSITION OF THE INFESTATION

Table 2 offers a comparison of the percentagesof volume killed by the different insects in 1937 and 1938 as determined by a basal examination of each tree killed. This basal examination does not in every case give the true picture as to the causal organism, but it does serve as a useful index in the majority of cases, particularly in years when the western pine beetle is the principal agent of destruction. It may be noted from this table that the chief difference in the two years lies in the fact that there has been a very marked increase in the proportion of volume killed by the western pine beetle in 1938 over that killed in 1937, 77 compared to 40 percent. Another point of interest is that there has been a marked decrease in volume killed by the California flathead, 1 percent for 1938 compared to 24 percent for 1937. There also appears to have been a marked tendency toward fewer mixed broods in 1938. The situation with regard to other insects has shown very little change over that in 1937.

Figure 2.

A group of 6 ponderosa pine, located in the White Horse Unit, killed during 1938. This group contained approximately 14,000 board feet of loss.

TABLE II.

Comparison of Volume Killed by Different Insects
in 1937 and 1938.

Insect Species	Percent of Volume Killed 1937	1938
Western Pine Beetle (Dendroctonus brevicomis)	40	77
Mountain Pine Beetle (Dendroctonus monticolae)	2	3
Turpentine Beetle (Dendroctonus valens)	0	3
Flathead Borer (Melanophila californica)	24	1
Mixtures	33	12
Unknown	1	3

EFFECT OF TOPKILLED TREES

Previously topkilled trees entered to a considerable extent into the current 1938 loss. Of the total volume loss for 1938, previously topkilled trees made up 36 percent of the volume. However, the indirect effect of topkills in the 1938 loss appears to be of additional importance, because in a large percentage of cases an old topkilled tree served as the focal point of infestation in a group where the insects first attacked the topkill and then overflowed into adjacent vigorous trees. Figure 3 shows an old topkilled tree which was the key tree in a 1938 group.

DEPLETION-INCREMENT RATIO

Green cruise and growth data exist for 5 of the present permanent Modoc sample plots. On these it has been possible to make a comparison between normal increment and depletion due to insects. This comparison for three years is shown in Table 3. The disturbing thing about the insect loss situation in the Modoc is that losses greatly exceed normal growth. It appears that we have been, and are, experiencing a run on the bank where our withdrawals are annually exceeding our deposits. Even in 1937 when our losses were at the lowest point since 1930, we were losing about three times our annual increment. In 1938 the loss was over four times the increment. These records represent years when the loss is relatively low compared with that registered during the peak of 1934.

LOSSES ON CUTOVER AREAS.

Only two cutover plots have been established on the Modoc to date and as these are both in the Glass Mountain unit it is thought that the records of loss should apply to this unit alone.

The losses for 1936, 1937 and 1938 are shown in Table 4. CO-5 represents a fairly good Modoc site and CO-26 a very poor site. These plots probably closely approximate the extremes in this unit. It may be noted that there is considerable variance between these two plots, both in residual stand and subsequent loss.

LOSSES BY INFESTATION UNITS

Table 5 and Figure 4 offer a comparison of total losses by different units for that section of the Modoc covered by survey plots. As these sample plots do not uniformly sample all units, it is difficult to make an entirely reliable estimate of each unit. For that reason the figures on loss in table 5 and figure 4 are at the best gross estimates.

Figure 3.

A group of two 1938 trees on Sample Plot RS-1 near Hackamore. The tree on the left, an old topkill, initiated the group. This condition is quite typical of a high percentage of the 1938 groups.

TABLE III.

Comparison of Growth and Insect Loss on 5 Permanent Modoc Sample Plots.

Plot No.	Increment Ave. Growth* per acre per year. Vol. B.M.	Insect Depletion 1936 Vol. B.M. per acre	1936 Ratio Depletion Increment	1937 Vol. B.M. per acre	1937 Ratio Depletion Increment	1938 Vol. B.M. per acre	1938 Ratio Depletion Increment
RS-1	36	185	5.1	117	3.2	166	4.6
RS-2	42	107	2.5	76	1.8	148	3.5
RS-5	21	120	5.7	146	7.0	151	7.2
RS-6	39	87	2.2	103	2.6	161	4.1
RS-11	45	91	2.0	83	1.8	166	3.7
Average	37	118	3.2	105	2.8	158	4.2

TABLE IV.

Cutover Plots, Modoc

Plot No.	1936 Residual Stand Vol/acre	1936 Vol/acre B.M.	1936 % of Residual	1937 Vol/acre B.M.	1937 % of Residual	1938 (est) Vol/acre B.M.	1938 (est) % of Residual
CO-5	1,015	13	1.3	4	0.4	4	0.4
CO-26	194	33	17.0	16	10.0	7	4.8

TABLE V.

Estimated Loss per Unit Basis - Modoc
Virgin Stands

Unit	1936 Timbered Acreage	1936 No. trees	1936 Volume MBM	1937 Timbered Acreage	1937 No. trees	1937 Volume MBM	1938 (uncorrected for 1938 cutover) No. trees	1938 (uncorrected for 1938 cutover) Volume MBM
Glass Mountain	38,385	7,293	5,577	32,625	3,263	3,178	4,800	3,880
Badger	85,185	11,926	10,997	85,185	9,898	10,557	15,690	18,114
Happy Camp	59,962	7,195	5,678	59,322	5,972	5,450	9,450	7,500
Lava Beds	77,697	12,432	8,438	76,097	10,318	8,100	16,340	11,100
Pit River	31,720	5,392	3,775	31,240	4,475	3,624	7,100	4,960
Timber Mountain	1,600	480	144	1,600	398	1,536	480	160
Total	294,549	44,718	34,609	286,069	34,324	32,445	53,860	45,714
av -			117			113		

SUMMARY AND RECOMMENDATIONS

There has been a definite tendency toward grouping in the 1938 loss on practically all areas in the Modoc. The total loss for 1938 will probably approximate 160 board feet per acre and will exceed that for 1937 by approximately 40 percent. The low point in the past infestation cycle was reached in 1937 and appears now to be started on the up-swing. The proportion of volume killed by the western pine beetle for 1938 shows a definite increase over that registered for the previous year, while the proportion of volume killed by the California flathead shows a markel decrease in 1938.

The ineffectiveness of direct control unless practiced annually over large areas has been pointed out by Craighead (1), Salman (2) ad Johnson (3). These writers have shown that direct control is a temprary sedative and does not strike at the basic ailment. That is, even though direct control is practiced, the residual stand, particularly on the Modoc, is still made up of a high proportion of decadent, highly susceptibl trees. Unless stand sanitation measures are adopted which will redue the proportion of these susceptible trees, direct control is of little prmanent value. For that reason, direct control is not recommended for te Modoc, for the 1938 winter brood. However, in line with the present Bureau policy, it is expected that a sanitation cut which would remce all topkilled and other decadent trees would materially reduce subsequen losses due to insects. This type of tree has contributed a high perentage of the 1938 loss as well as being of great importance in contributin to group losses by predominantly occurring as the key tree in a group.

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(1) Craighead, F. C. et al. 1931. Control Work against Bark Beetles in Western Forests and an Appraisal of Its Results. Jour. For. 29 (): pp. 999-1018.

(2) Salman, K. A. 1934. Forest Insect Surveys - Modoc Nationa Forest. Season of 1934. Unpublished report, B.E. & P.Q., Forest Insect Invesigations, Berkeley, California.

(3) Johnson, P. C. 1936. Forest Insedt Surveys - Modoc Nationa Forest, Season of 1935. Unpublished report, B.E. & P.Q., Forest Insec Investigations, Berkeley, California.

NATIONAL MONUMENT

T. 45 N.

T. 44 N.

T. 43 N.

T. 42 N.

T. 41 N.

T. 40 N.

T. 39 N.

R.4E.

R.5E.

R.6E.

R.7E.

R.9E.

R.3 E.

TIMBER MTN.

GLASS MOUNTAIN

BADGER

LAVA BEDS

PIT RIVER

HAPPY CAMP

WHITE HORSE

S H A S T A

U.S. BUREAU OF ENTOMOLOGY
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MODOC NATIONAL FOREST, CALIFORNIA

- Less Than 25 (Cutover)
- 25 to 100
- 100 to 200
- 200 to 300

MEMORANDUM FOR THE FOREST SUPERVISOR, MODOC NATIONAL FOREST

Ile Hacks

12J

Re: Dead Juniper in the Vicinity of Caldwell Butte.

On July 11th Mr. Bacon called at the Hackamore Field Laboratory to direct our attention to your recent observation of dead and dying Juniper in the vicinity of Caldwell Butte.

This area, situated in Township 45 North, Range 5 East, and largely in Section 35, was visited by the writer and R. F. Anderson, of the Hackamore Laboratory, on July 14th, and again by the latter on July 18th.

Numerous dead and partially killed Junipers were observed Southeast of the Monument Headquarters. In the vicinity of the Caldwell Caves road scattered trees were noted while the condition was most pronounced on a steep Northeast exposure nearer the Monument Headquarters. On the latter site approximately 50 per cent of the trees were either completely or partially killed. Partial injury varied from any extent of topkilling to the killing of individual branches. Injury was noted in individuals of all sizes.

Dead material was examined both in the field and at the Laboratory. In some samples there was no evidence of insect work. In other specimens there was evidence of infestation by two species of insects, the Juniper Bark Beetle, Phloeosinus juniperi Sw., and the Western Juniper Borer, Trachykele blondeli juniperi Burke. Although both species may work in living trees, they are, and particularly the latter, frequently associated with injured and dying host material. Examination showed that none of the insect work was current. Since the Western Juniper Borer has a life cycle of at least two years, it is believed that the original injury occurred at least two years ago. Numerous borer emergence holes were found together with a dead adult which had failed to emerge.

From the nature of the insect infestation and the type of killing it is concluded that the insect factor was secondary. The original injury may have been due to the severe cold of January, 1937. Similar complete and partial killing is known to have occurred on the Modoc in Ponderosa Pine and Incense Cedar.

The extent of killing was localized and does not constitute any threat to forage. Examination failed to reveal any current insect attacks such as might have resulted from the building up of populations in this material.

Hackamore Field Laboratory
July 19, 1939.

A. S. West, Jr.
Assistant Conservationist.

Approved by:

Dr. Salman

S
SALES - Modoc
General

San Francisco, California,
August 1, 1939

MEMORANDUM FOR MR. WOODBURY:

Mr. Norton and I went to the Hackamore CCC Camp on July 19 and were met there by Dr. Salman and Phil Johnson from the Bureau of Entomology. Messrs. Beeson and Bacon from the Modoc Forest also spent July 21 with us but were prevented from further participation in the study of the area by the East Sand Butte fire.

A Bureau of Entomology crew, Phil Johnson in charge, had completed a strip cruise of the entire area adjacent to Hackamore and, in accordance with previous agreement, had tagged the insect risk 3 and 4 trees on 18 two acre samples well distributed over the Badger township and the adjacent Pickering timber that will be acquired in exchange.

Mr. Johnson's original notes permitted us to reconstruct the entire plots so that Norton and I were able to log grade the risk 1 and 2 trees as well as the 3 and 4 trees that were tagged. When time permits this fall, we will be able to calculate estimated lumber values by risk class. The net volume data was hurriedly computed in the field and indicated a distribution per acre among risk classes as follows:

	Risk 1		Risk 2		Risk 3		Risk 4		Total
	Net Vol.	%	Net Vol.	%	Net Vol.	%	Net Vol.	%	Net Vol
# 994	715	21.5	1,235	37.2	925	27.9	445	13.4	3,320
# 995	920	8.2	4,115	34.8	6,195	52.4	540	4.6	11,820
# 996	5,215	30.0	6,090	35.0	1,490	8.6	4,595	26.4	17,390
#1051	3,595	27.8	8,540	66.1	790	6.1			12,925
#1081	3,240	22.9	7,145	50.4			3,790	26.7	14,175
# 998	2,335	25.9	4,305	47.7	1,295	14.4	1,085	12.0	9,020
# 999	3,740	33.1	3,545	31.4	3,695	32.8	310	2.7	11,290
#1060	3,600	48.9	130	1.8	275	3.7	3,360	45.6	7,365
#1075	3,480	35.3	2,655	26.9	1,940	19.7	1,780	18.1	9,855
#1033	1,100	76.9	290	20.3	40	2.8			1,430
#1003	6,680	62.4	2,790	26.1	1,235	11.5			10,710
#1002	740	8.9	1,460	17.6	2,055	24.8	4,035	48.7	8,290
#1009	6,175	61.3	3,530	35.0			375	3.7	10,080
#1030	1,970	21.0	4,720	50.3	840	8.9	1,855	19.8	9,385
#1041	900	36.4	1,220	49.3	355	14.3			2,475
#1038	775	7.7	4,475	44.4	1,205	12.0	3,620	35.9	10,075
#1	2,305	16.7	7,360	53.4	3,000	21.8	1,125	8.1	13,790
#1048	1,705	17.8	1,695	17.7	3,765	39.2	2,425	25.3	9,590
Total Badger	2,733	28.4	3,628	37.8	1,617	16.8	1,630	17.0	9,608
#2	10,705	55.6	6,095	31.7	845	4.4	1,595	8.3	19,240
#3	1,485	18.2	1,595	19.5	845	10.3	4,255	52.0	8,180

Both volume per acre and distribution by risk classes show wide variance over this area. Samples #2 and #3 were south of the highway toward Happy Camp Mountain and show somewhat similar variance of distribution in that region.

On July 24, Norton and I visited the Shaw Lumber Company's plant at Tionesta. Unfortunately, the owner, J. R. Shaw, was in Klamath Falls but we had a long discussion with his son L. L. Shaw. Mr. Shaw stated that with roads in place, there was practically no lower limit to the volume per acre that could be logged, the main limit being the desirability for sufficient timber within a 250 foot radius to provide a truck load of 5,000 feet, B.M.

He also stated that although they had about 400 million feet of Red River and Pickering stumpage tied up with a minimum cutting contract for 20 million Red River per year, he thought they might be interested in taking from 5 to 10 million per year from the Badger area on a light cutting basis, especially if the Forest Service permitted the shipment of logs to Klamath Falls. Mr. Shaw stated that they had been selling some logs in Klamath Falls at from $11.50 to $12.50 delivered, with a freight and loading cost of approximately $2.00.

The present road development of the area fits in particularly well with the shipment of logs by rail, as all roads now in the area radiate from Hackamore or Boles on the S.P. railroad, whereas a truck haul to Shaw's mill, which is on the Great Northern R.R. would require construction of approximately 14 miles of good road from Badger Well to Timber Mountain through a flat but rather broken lava terrain.

At first glance, it would appear that if logs can be sold for $11.50 or more, that it would be feasible to log the risk 4 trees where they provide a volume of 2,000 feet per acre or more. It may be worth while for Supervision Beeson to discuss the possibilities with Mr. J. R. Shaw pending more detailed analysis to be made this winter. If the Shaw Lumber Company is not interested, it appears that the only other possibility is for Government logging with sale of logs in Klamath Falls.

Norton and I visited the region east of Happy Camp Mountain where the Shaw Lumber Company was logging in Pickering timber. This company's logging method appears to be ideally suited for logging light volumes per acre.

Main roads are constructed double width and kept in good shape by watering. Spur roads are very simple in the flat country, one trip with a grader or bulldozer being sufficient to level the surface and remove loose rocks.

Logging is handled by two tractors which skid up to 200 feet and bunch logs along either side of the main or spur roads. A 1½ yard Northwestern gas shovel with 40 foot boom is used for loading on trucks, starting at the back end of the road and working out. By moving the truck and loader from one deck to another, it is possible to pick up any size bunch

but, of course, loading is speeded up if each bunch contains one or more even loads so that moving can be done between loads.

With two tractors and nine trucks, the company is putting in better than 200 M feet per day. The trucks are operated in two 8 hour shifts over the 30 mile haul.

John R Berry

JOHN R. BERRY,
Senior Logging Engineer.